



Low-Carbon Fuel Standards and an Equitable Transition to Clean Transportation

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Executive Summary

This report examines how low-carbon fuel standards (LCFS) can be used to ensure an equitable transition to clean transportation.

Greenhouse gas effects such as wildfires, floods, and other extreme weather events - disproportionately affect overburdened communities, including but not limited to communities of color, low-income communities, and rural communities. Additionally, higher upfront costs of clean vehicles make it much harder for low-income households to afford them and benefit from the cost savings that come with owning them.

Low-carbon fuel standards such as those adopted by California and Oregon are helping to mitigate some of these issues by creating momentum toward cleaner fuel sources and infrastructure, lowering GHG emissions, and directing a portion of the revenue they generate to projects that directly benefit these communities.

Under California's LCFS, at least \$900 million has been directed to benefit overburdened communities since the start of 2018. Oregon's Clean Fuel Program has fully funded Portland General Electric's Drive Change Fund Grant program, which has awarded \$4.7 million since 2019, resulting in 93 new electric vehicles and 86 chargers.¹

LCFS revenues can be used in overburdened communities to offset the cost of clean fuel vehicles for low-income consumers, create more accessible and affordable charging and fueling options for them, develop campaigns to raise awareness about these programs, and identify and implement reporting guidelines to create transparency and accountability for the use of these funds. Overall, providing these communities with easily accessible, more affordable, and reliable clean vehicle fueling locations will make it much more feasible for these communities to own and operate EVs and other clean fuel vehicles, as well as help speed up the transition to clean transportation, while increasing the benefits they receive from the transition.

¹ Oregon Department of Environmental Quality, "Utility Programs," 2023, <https://www.oregon.gov/deq/ghgp/cfp/Pages/utility.aspx>

Introduction

The biggest source of greenhouse gas (GHG) emissions in the United States is the transportation sector, at 28%.² GHGs cause many adverse climate impacts, including increased wildfires, floods, and other extreme weather events³, leading to billions of dollars in damage and increasing insurance premiums for consumers.⁴

Low-carbon fuels (LCFs) can be used to reduce GHG emissions from transportation. An LCF is a transportation fuel that has a lower carbon intensity (CI) than gasoline or diesel derived from fossil fuels. The CI is determined by the fuel's well-to-wheel life cycle GHG emissions, that is, the total GHG emissions generated from the fuel's production, processing, distribution, and use. It is typically calculated as grams of carbon dioxide (CO₂) equivalent per unit of energy (usually a megajoule) of a fuel, which is abbreviated asgCO₂e/MJ.⁵ Some examples of LCFs include hydrogen, certain biofuels, natural gas, sustainable aviation fuel (SAF), and even electricity.

Low-carbon fuel standards (LCFS) or clean fuel standards (CFS) help to lower these GHG emissions from the transportation sector by lowering the average CI of transportation fuels. Petroleum refiners, wholesalers, and importers are considered to be “fuel reporting entities” under these standards and must abide by them, while producers of low-CI alternative fuels such as biodiesel, hydrogen, and electricity may opt into these programs and are therefore considered “opt-in entities.”

An LCFS requires fuel reporting entities to ensure the average CI of their petroleum-based fuels is lower than a set standard, or to compensate for any excess CI through the purchase of credits. This is facilitated by creating a technology-neutral trading mechanism that incentivizes the use of low-carbon fuels by generating credits or deficits based on a fuel's CI compared to the standard. Fuels with a higher CI generate deficits, while fuels with a lower CI generate credits. A credit can be thought of like a share of a company in the stock market. Once the stock is purchased, it can be sold to another buyer; once a credit is generated, it can be sold to a fuel reporting entity that needs to balance its deficits. Deficits can be compared to credit-card debt. In order to keep using a credit card, the debt must be paid off; in order for fuel reporting entities to maintain compliance, any deficits they generate must be made up for by purchasing credits.

² U.S. Environmental Protection Agency, “Sources of Greenhouse Gas Emissions,” 2023, <https://www.epa.gov/ghgemissions/sources-greenhouse-gas-emissions#transportation>

³ Consumer Reports, “Low Carbon Fuel Policy Principles,” <https://advocacy.consumerreports.org/wp-content/uploads/2022/11/Low-Carbon-Fuel-Policy-Principles.pdf>

⁴ NOAA National Centers for Environmental Information (NCEI), “U.S. Billion-Dollar Weather and Climate Disasters”, 2023, <https://www.ncei.noaa.gov/access/billions/>

⁵ U.S. Department of Energy, “Alternative Fuels Data Center,” https://afdc.energy.gov/vehicles/electric_emissions.html#:~:text=Well%2Dto%2Dwheel%20emissions%20include.and%20burning%20it%20in%20vehicles

How LCFS Credits Work

Existing LCFSs set a CI performance standard for each year that reflects well-to-wheel CI across transportation fuels. The CI standard is set below the CI of gasoline (99.44 gCO₂e/MJ) and diesel (100.45 gCO₂e/MJ)⁶ and decreases each year to achieve continued emission reductions.

For example, the California Air Resources Board (CARB) has set a CI standard in California for 2023 of 88.25 gCO₂e/MJ for gasoline and gasoline substitutes and a standard of 89.15 gCO₂e/MJ for diesel and diesel substitutes. These have decreased every year since the original benchmarks, set in 2011, of 95.61 gCO₂e/MJ for gasoline and 94.47 gCO₂e/MJ for diesel.⁷

Fuel suppliers generate either deficits or credits under this policy: deficits are awarded in proportion to the amount that the average CI of their fuels exceeds the standard, and LCFS credits are awarded when a fuel with a lower CI than the standard is supplied to the market. These credits are awarded directly to the supplier of the low-carbon fuel. In order to meet the standard, fuel reporting entities with deficits must either generate or buy LCFS credits through the established markets. This creates incentives to increase investments in LCFs and technologies that reduce carbon dioxide emissions. While fuel reporting entities are the importers, refiners, and wholesalers of petroleum products, an opt-in entity can be any entity that generates LCFS credits and can include electricity suppliers, bio-fuel refiners, and others. These opt-in entities will generate revenue through the LCFS by selling the credits they earn to fuel reporting entities that generate deficits. Shown below in figure 1 are the alternative fuels that generate the largest amount of credits as well as the volume of fuel produced.

⁶ California Air Resources Board, "Low Carbon Fuel Standard," 2020, https://ww2.arb.ca.gov/sites/default/files/2020-07/2020_lcfs_fro_oal-approved_unofficial_06302020.pdf

⁷ California Air Resources Board, "Low Carbon Fuel Standard," 2020, https://ww2.arb.ca.gov/sites/default/files/2020-07/2020_lcfs_fro_oal-approved_unofficial_06302020.pdf

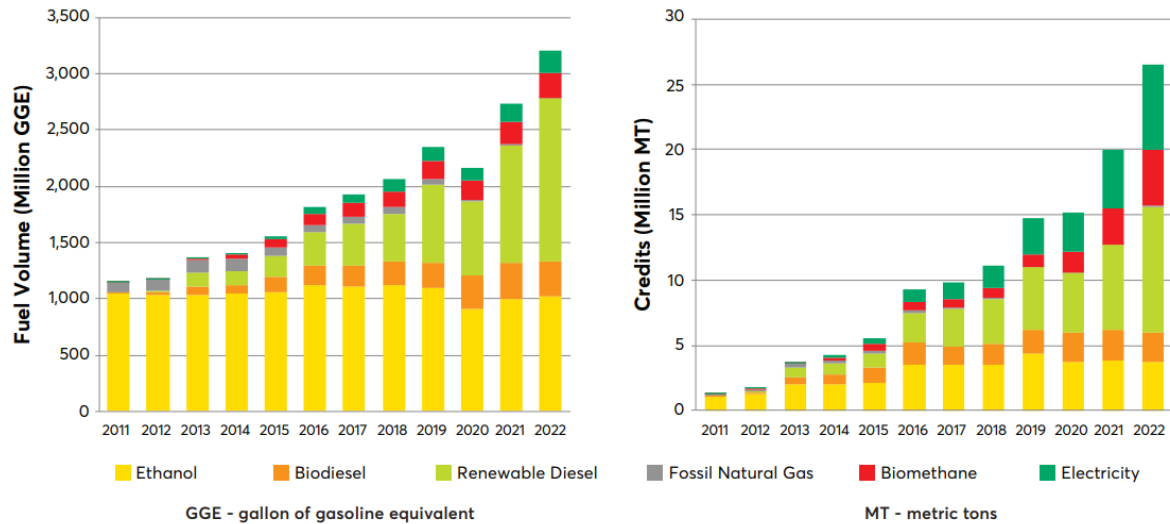


Figure 1. Alternative Fuel Volumes and Credit Generation in California⁸

Because a well-to-wheel life cycle assessment is used, the CI of electricity is not zero; however, it has the lowest CI of current LCFs and therefore generates the largest number of credits per unit of fuel. An opt-in entity can generate credits from electricity under the LCFS as long as the electricity it produces is being used for residential or non-residential EV charging or electric public transit.⁹ The revenue streams created by an LCFS will create more momentum toward the transition to fuel sources with the lowest CI, including electric vehicles (EV) and the development of EV infrastructure. An LCFS should also maintain a technology-neutral approach to account for future fuel technologies that come to market and include measures that help ensure the transition to a clean energy future is equitable for all consumers.

⁸ California Air Resources Board, "LCFS Data Dashboard," 4/28/2023, <https://ww2.arb.ca.gov/resources/documents/lcfs-data-dashboard>

⁹ California Air Resources Board, "Low Carbon Fuel Standard," 2020, https://ww2.arb.ca.gov/sites/default/files/2020-07/2020_lcfs_fro_oal-approved_unofficial_06302020.pdf

LCFS Credit Revenues and Equitable Transition to Clean Transportation

An LCFS can be used as a tool to create an equitable transition to clean transportation by addressing two major issues related to overburdened communities: economic disparities and inequitable access.

Different policies and regulations often define the terms disadvantaged, marginalized or overburdened differently depending on local or federal context. A clear definition of these terms needs to be included in LCFS language in order to ensure transparency and clarity about which communities the term encompasses. This definition needs to be determined by the governing body as each state has different demographics and communities that must be prioritized. Some examples of overburdened communities include communities of color, low-income communities, and rural communities.

Economic Disparities

Overburdened communities often miss out on the economic benefits that come with owning a clean-fuel vehicle including cheaper fueling costs, lower maintenance costs, and even free or discounted access to carpool lanes in states like California. This can lead to a self-perpetuating cycle of inequities.

One reason for this dynamic is that low-income consumers often struggle to afford new technologies and improvements as they are introduced into the car market. In November 2021, the average transaction price of an electric car was \$10,000 higher than the industry average.¹⁰ As of June 2023 the average transaction price of an electric car was about \$5,000 higher.¹¹ And according to modeling by the International Council on Clean Transportation, the average price of electric vehicles is not expected to reach parity with the industry average until 2025.¹² These higher upfront costs have made it much harder for low-income households to afford new clean vehicles and benefit from the cost savings that come with owning a clean vehicle.

Therefore, low-income households are more likely to purchase used vehicles, and due to the higher costs and limited supply of EVs, it is easier for low-income households to buy internal combustion engine (ICE) vehicles. In the used car market, clean vehicles make up an incredibly small percentage of total used car sales. The three states with the highest percent of used EVs

¹⁰ Natural Resources Defense Council, “Electric vs. Gas Cars: Is it Cheaper to Drive an EV?”, 2022, <https://www.nrdc.org/stories/electric-vs-gas-cars-it-cheaper-drive-ev>

¹¹ Kelley Blue Book, “Kelley Blue Book Analysis: Average New-Vehicle Transaction Price in June Posts Smallest Annual Gain in Nearly 4 Years,” 2023, <https://mediaroom.kbb.com/2023-07-11-Kelley-Blue-Book-Analysis-Average-New-Vehicle-Transaction-Price-in-June-Posts-Smallest-Annual-Gain-in-Nearly-4-Years>

¹² International Council on Clean Transportation, “Analyzing the Impact of the Inflation Reduction Act on Electric Vehicle Uptake in The United States,” 2023, <https://theicct.org/wp-content/uploads/2023/01/ira-impact-evs-us-jan23-2.pdf>

in the US market are California at 27.75%, Texas at 8.39%, and Florida at 7.67%, with the average price of these vehicles at \$36,193, \$40,977 and \$39,409, respectively.¹³ While these high prices are, on average, largely due to used EVs mostly being newer models, policies can be used to help mitigate these high up-front costs for low-income households.

Inequitable Access to Clean Vehicle Infrastructure

Survey data suggests that greater access to charging/clean fuel infrastructure makes it more likely that consumers will adopt clean fuel vehicles. According to a 2022 Consumer Reports nationally representative survey of 8,027 Americans, for example, 61% of Americans who were not already planning to buy or lease an EV listed charging logistics as a barrier to doing so.¹⁴

The installation of home chargers is a common solution to this barrier. Charging at home is generally the most affordable way to charge EVs,¹⁵ and is the most effective way for consumers to benefit economically by transitioning to clean vehicles. Thus, making more at-home charging opportunities accessible is critical to increasing access to clean vehicles.¹⁶

However, at-home charging is not an option for many Americans. A large portion of overburdened communities live in apartment-style or multi-family housing structures, where limited access to off-street parking makes it much harder to implement at-home charging for EVs. White Americans are more likely to reside in a single-family home and to own their own residence than other Americans, while Black and Latino Americans who own a car are more likely than white Americans to use public or on-street parking.¹⁷ Low-income communities are often left behind when it comes to charging infrastructure as well. In April 2023, an analysis by Bumper.com found that 71.68% of public EV charge ports in the US are located in the top 20% of counties based on income.¹⁸ (A charge port can charge one EV at a time; a charging station is made up of multiple charge ports.) Less investment in charging infrastructure in overburdened communities means lower numbers of EV chargers and often leads to “charging deserts” where it is difficult to access charging locations.¹⁹

¹³ Recurrent Auto, “Used Electric Car Prices & Market Report” - Q2 2023, 2023, <https://www.recurrentauto.com/research/used-electric-vehicle-buying-report>

¹⁴ Consumer Reports, “Battery Electric Vehicles & Low Carbon Fuels Survey,” 2022, https://article.images.consumerreports.org/image/upload/v1657127210/prod/content/dam/CRO-Images-2022/Cars/07July/2022_Consumer_Reports_BEV_and_LCF_Survey_Report.pdf

¹⁵ Kelley Blue Book, “How Much Does it Cost to Charge an Electric Car?”, 2023, <https://www.kbb.com/car-advice/how-much-does-it-cost-to-charge-an-ev/>

¹⁶ Science Direct, “Public Electric Vehicle Charger Access Disparities Across Race and Income in California,” 2021, <https://www.sciencedirect.com/science/article/pii/S0967070X20309021#bib20>

¹⁷ Consumer Reports, “Survey Says: Considerable Interest in Electric Vehicles Across Racial, Ethnic Demographics,” 2022, <https://advocacy.consumerreports.org/wp-content/uploads/2022/09/EV-Demographic-Survey-English-final.pdf>

¹⁸ Bumper.com, “EV Deserts: County Economic Groups Show EV Charger Divide Across US States,” 2023, <https://www.bumper.com/analysis/ev-charging-station-deserts-state-ranking/>

¹⁹ Clean Energy Group, “Electric Vehicles in the Community: Challenges and Solutions,” 2023, <https://www.cleanegroup.org/electric-vehicles-in-the-community-challenges-and-solutions/>

Current LCFS Programs and Policy Recommendations

Below, we look at how existing state LCFSs address inequities by directing funding toward low-income and other overburdened communities, and then offer recommendations for broader use of LCFS for this purpose.

Existing LCFS Programs

California. California’s LCFS states that 30% to 50% of credit revenue earned by electricity distribution utilities (EDUs) must be used on projects that primarily benefit overburdened communities. These projects may include the electrification of school or transit buses and drayage trucks; investments in public EV charging infrastructure, including infrastructure in multi-family residences; funding to develop multilingual marketing and education programs to increase awareness and adoption of EVs; and funding to create additional rebates and incentives for low-income individuals beyond existing local, state, and federal rebates or incentives. EDUs may also coordinate with local environmental justice advocates, local community-based organizations, or local municipalities to develop projects specifically created for these areas.²⁰

If we assume that all the LCFS credits generated by EDUs in California over the past five years were sold, they generated approximately \$3 billion in sales (See Table 1, below). If we conservatively estimate that 30% of the revenue from these credit sales are used for these projects, at least \$900 million has been redirected toward benefiting overburdened communities since the start of 2018.

²⁰ California Air Resources Board, “Low Carbon Fuel Standard,” 2020, https://ww2.arb.ca.gov/sites/default/files/2020-07/2020_lcfs_fro_oal-approved_unofficial_06302020.pdf

Table 1 California Credit Transfer Data^{21,22}

Year	Average Credit Price (\$/MT)	Total Electricity Credit Volume (MT)	Total Value (\$)
2018	160	1,800,000	\$288,000,000
2019	192	2,800,000	\$537,000,000
2020	199	2,900,000	\$577,000,000
2021	187	4,500,000	\$841,500,000
2022	125	6,500,000	\$812,500,000

One program that is completely funded by the California LCFS is the California Clean Fuel Reward program. This program entitles Californians to an average price savings of \$1,080 when they buy or lease an EV or a plug-in hybrid. Since the start of the program in November 2020 through June 2023, 386,056 customers have taken advantage of the program, saving themselves \$416.8 million and reducing CO₂ emissions by an estimated 1.2 million metric tons.²³ Of the consumers who benefited from the program, 21.2% were from underserved communities. California’s LCFS has generated large amounts of revenue and also contributed to a 12.63% reduction in carbon intensity since 2011, ahead of the 2022 goal of 10%.

²¹ California Air Resources Board, “LCFS Credit Transfer Activity Reports,” 2023, <https://ww2.arb.ca.gov/resources/documents/lcfs-credit-transfer-activity-reports>

²² California Air Resources Board, “LCFS Data Dashboard,” 2023, <https://ww2.arb.ca.gov/resources/documents/lcfs-data-dashboard>

²³ Clean Fuel Reward, “Reporting,” 2023, <https://cleanfuelreward.com/reporting#mark-equity>

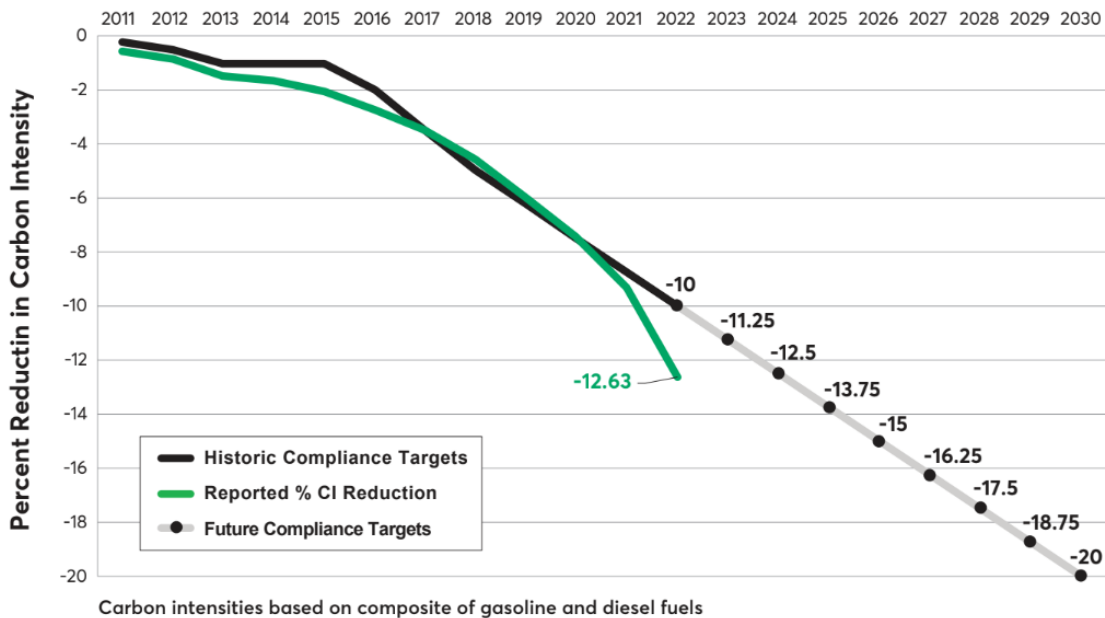


Figure 2 California 2011-2022 Performance of Low-Carbon Fuel Standard²⁴

Oregon. Like California’s standard, Oregon’s Clean Fuels Program requires EDUs to use a percentage of the revenues they generate from credit sales on projects that benefit overburdened communities.

Oregon’s program also mandates the creation of an “equity advisory committee” made up of representatives from environmental justice communities and transportation experts to develop an annual work plan that will benefit the communities most vulnerable to the adverse effects of transportation emissions and climate change.²⁵

One of Oregon’s largest utility companies, Portland General Electric, has introduced a program called the Drive Change Fund Grant which is aimed at helping to electrify transportation in Oregon and is completely funded by Oregon’s Clean Fuel Program. Since its inception in 2019, \$4.7 million dollars have been awarded, resulting in 93 new electric vehicles and 86 chargers.²⁶ While any community organizations, non-profits, or businesses can apply for this grant, preference is given to projects that directly engage with environmental justice communities.

²⁴ California Air Resources Board, “LCFS Data Dashboard,” 2023, <https://ww2.arb.ca.gov/resources/documents/lcfs-data-dashboard>

²⁵ Oregon Department of Environmental Quality, “Oregon Clean Fuels Program,” 2022, https://secure.sos.state.or.us/oard/displayDivisionRules.action:JSESSIONID_OARD=aDLZ1AID4U0P755dclTb9uORnmpHc5szQ_d6al0Tw7_t0Fwgn-1F!48253970?selectedDivision=1560

²⁶ Oregon Department of Environmental Quality, “Utility Programs,” 2023, <https://www.oregon.gov/deq/ghgp/cfp/Pages/utility.aspx>

Washington State. Washington is the most recent state to adopt a clean fuel standard, which went into effect January 1, 2023. It aims to reduce the carbon intensity of transportation fuels to 20% below 2017 levels by 2034. Similarly to the California LCFS and the Oregon CFS, the Washington standard includes a requirement that 50% of the allocated revenue generated by EDU's from credit sales be used to support the expansion of clean transportation projects, including projects that are located in or directly benefit disproportionately impacted communities.²⁷

Policy Recommendations

An LCFS can be used not only to lower GHG emissions, but also—by requiring that credit revenues from the standards are spent on projects benefiting overburdened communities—to ensure that those communities are included in the transition to clean transportation.

Create clear definitions of target communities. To ensure accountability, the standards must include a clear and precise description of the communities included in the term “overburdened” or “disadvantaged.” The California LCFS definition, for example, includes, but is not limited to, communities disproportionately affected by climate change, low-income communities, and sensitive populations.

Direct LCFS revenue to overburdened communities. As is included in California’s LCFS and Oregon’s clean fuel program, EDUs and other credit generators should be required to direct a significant percentage of the credit revenues they generate to projects that benefit overburdened communities in their respective service areas. These funds should be used in overburdened communities to

- create programs that offset the cost of clean fuel vehicles,
- create more accessible and affordable charging and fueling options,
- develop campaigns to raise awareness about these programs, and
- identify and implement tracking mechanisms and reporting guidelines to create transparency and accountability for the use of the funds.

Structure incentives by income level. To help address the inequity in clean fuel vehicle adoption and offset the cost of clean vehicles, purchase incentives for new and used clean fuel vehicles should be provided based on income level. This could include incentives similar to Clean Cars 4 All²⁸ in California, which helps low-income communities scrap old high-emission vehicles and replace them with zero- or low-emission vehicles. Providing these incentives and subsidies based on income level ensures that the funds are going to consumers in communities that will maximize the benefits of clean vehicles.

²⁷ Washington State Department of Ecology, “Washington Transportation Fuel - Clean Fuels Program,” 2023, <https://app.leg.wa.gov/RCW/default.aspx?cite=70A.535>

²⁸ California Air Resources Board, “Clean Cars 4 All,” 2023, <https://ww2.arb.ca.gov/sites/default/files/movingca/vehiclescrap.html>

Develop infrastructure for multi-family housing dwellers. Limited access to clean vehicle fueling stations in overburdened communities can be combated with investments into public and workplace charging stations as well as incentivizing landlords of multi-unit and rented housing. These efforts should include funding for zero-emission fueling infrastructure in identified overburdened communities and for universal preloaded contactless debit cards for qualified low-income consumers to use at a variety of clean vehicle fueling stations. This would help increase adoption of EVs and other clean vehicles in overburdened communities by providing them with easily accessible, more affordable, and reliable clean vehicle fueling locations.

Invest in education and outreach programs. Awareness of these different programs can be increased with funding for education and outreach programs such as community-based clean vehicle awareness campaigns. These campaigns should be developed by working with local environmental justice groups and other local organizations to determine the needs of their communities. This could include informational webinars, clean fuel vehicle test-driving events, and education on current and new incentives.

Ensure transparency and accountability. LCFS revenues and progress toward program goals should be tracked using transparency and accountability mechanisms. To ensure greater transparency, the agencies responsible for administering these programs should establish consistent reporting guidelines and public-facing reports that measure the success of the adopted programs at reaching consumers within the targeted communities. Additionally, if the programs identified do not maximize benefits for overburdened consumers, administering agencies should have the ability to revisit and amend program guidelines as needed.